

## Lecture Module - Sensors

ME3023 - Measurements in Mechanical Systems

Mechanical Engineering

Tennessee Technological University

### Topic 2 - IC and MEMS based Sensors

## Topic 2 - IC and MEMS based Sensors

- Integrated Circuits
- Micro Electro-Mechanical Devices
- Accelerometer
- Compass or Orientation Sensor

# Integrated Circuits

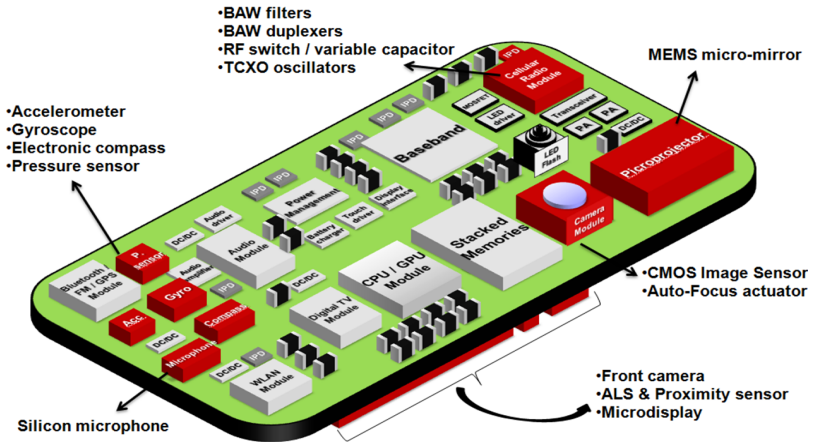
# Integrated Circuits

## Activity: Group Brainstorming

List three applications or devices that use IC based sensors.

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# Integrated Circuits



# Micro Electro-Mechanical Devices



**Activity:** Group Brainstorming List three sensors that are found on a high performance quadcopter or drone.

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# Accelerometer

An accelerometer is a tool that measures proper acceleration, which is the acceleration of a body in its own instantaneous frame.

Applications:

- Navigation Systems - Robotics - Aircraft - Missiles
- Personal Devices - Phones - Tablets
- Others:

# Accelerometer

Thought Exercise: How do we measure acceleration?

**Activity:** Group Brainstorming

Explain one method for measuring acceleration of a body.



# Accelerometer

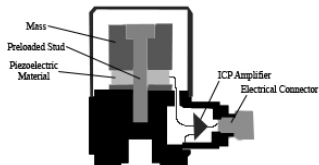
Mechanical Accelerometers Consist of a damped mass spring system and a sensing device.

Types of accelerometers:

- Seismometer or Seismograph
- piezoelectric - charge in material resulting from mechanical stress
- piezoresistive - change in resistance resulting from mechanical stress
- capacitive

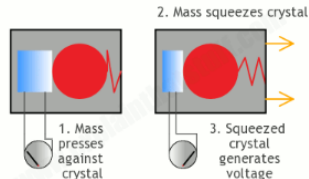
# Accelerometer

piezoelectric accelerometer



## Piezoelectric accelerometer

[www.explainthatstuff.com](http://www.explainthatstuff.com)

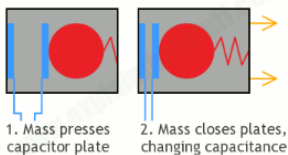


# Accelerometer

## capacitive accelerometer

Capacitive accelerometer

www.explainthatstuff.com



# Compass or Orientation Sensor

**Thought Exercise:** How do we measure **motion**?

- What variable or quantity is used to describe motion?

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- What type of sensor is used to measure this?

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# Compass or Orientation Sensor

- What applications require this type of sensor?



# Compass or Orientation Sensor

**Thought Exercise:** How do we measure **orientation**?

- What variable or quantity is used to describe **orientation**?
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  - 
  -
- What type of sensor is used to measure this?
  - 
  - 
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# Compass or Orientation Sensor

- What applications require this type of sensor?

